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ABSTRACT

Students in adult basic education/general educational development classes need skills in analyzing and solving programs, extending beyond those learned through word problems in the mathematics curriculum. The following strategies can help students broaden their problem-solving skills: (1) act it out, (2) construct a table, (3) draw a picture, (4) guess and check, (5) look for a pattern, (6) make a model, (7) make an organized list, (8) solve a similar problem, (9) use logical reasoning, (10) use objects, (11) work backwards, and (12) write an equation. One approach to problem solving is to determine possible strategies, choose one to solve the problem, and decide whether this was an effective choice. In teaching adults problem solving through mathematics, the teacher needs to provide time for students to grapple with problems, search on their own for solutions, and learn to evaluate their results. Students need to develop interest in finding solutions, confidence to try strategies, willingness to risk failure and to persevere, ability to accept frustrations, and understanding of the difference between not knowing the answer and not having found it yet. Teachers should model these attitudes so students will perceive problem solving as a valued skill. (Three mathematical problems are included in the document.) (SK)

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TECHNIQUES

Techniques for Teaching Word Problems

by Ina Miller, math instructor in the St. Mary Parish Adult Education Program in Morgan City, Louisiana

Word problems serve as the vehicle for developing understanding of mathematics and provide problem-solving contexts that demonstrate a reason for studying mathematics. This role of word problems in the math curriculum is extremely important and valuable. However, the mathematical problem-solving situations students need to face in the ABE/GED program extend beyond what traditional word problems offer.

Students need to learn various problem-solving procedures that are generally useful for analyzing and solving problems. Problem-solving procedures are called strategies. Strategies are not specific to particular problems or to particular areas of the mathematics curriculum, but can be applied alone or in combination with other strategies to solve a wide variety of problems. Many strategies are used intuitively by problem solvers in seeking solutions. However, gaining familiarity with a collection of strategies, seeing them modeled and then trying to apply them, can provide students with useful tools for tackling problems. Studying problem-solving strategies offers students the potential to broaden their problem-solving strategies: (1) Act it out, (2) Construct a table, (3) Draw a picture, (4) Guess and check, (5) Look for a pattern, (6) Make a model, (7) Make an organized list, (8) Solve a simpler (or similar problem, (9) Use logical reasoning, (10) Use objects, (11) Work backwards, and (12) Write an equation.

The following exercise focuses on solving problems using several different strategies. For each of the following problems, decide which strategies would be possible for you to use. It's useful to do this in a small group. After making a list of all that are possible, choose one strategy to solve each problem. (If you're doing this in a group, you may not all choose the same strategy to use.) Then solve the problem. Record for each of the problems as indicated.

Problem #1: Show all the ways that 15 coins can be put into four piles so that each pile has a different number of coins in it.

Possible Strategies: _____

Choose one: _____

Solution: _____

Was your strategy an effective choice? Why or why not? _____

_____

Problem #2: Lisa and David are playing a game. At the end of each round, the loser gives the winner a nickel. After a while, David has won 3 games, and Lisa has 3 more nickels than he did when he began. How many rounds did they play?

Possible Strategies: _____

Choose one: _____

Solution: _____

Was your strategy an effective choice? Why or why not? _____

_____

HOW TO USE TECHNIQUES

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Problem #3: If you spend $1.85, and pay with a $10.00 bill, you get $8.15 in change. Notice that the digits in your change are the same as the digits in what you spent. There are four other amounts you could spend so that the change has the same digits. Find them.

Possible Strategies: _____

Choose one: _____

Solution: _____

Was your strategy an effective choice? Why or why not? _____

_____

It is important to discuss with students both the strategies they use when solving problems, and whether those were effective choices. It is helpful to have the list of problem-solving strategies posted in the room. That way when you are summarizing a problem with your class, you can use the list as a reference for helping them label their methods. As students become familiar with the various strategies, they can refer to the list as a source for approaches when needed.

When considering how to organize math instruction that is based on problem solving and responsive to how adult students learn mathematics, it is important to look carefully at both the teaching and learning aspects of the classroom. A problem-solving focus requires a different role for the teacher. Rather than directing a lesson, the teacher needs to provide the time for the students to grapple with problems, to search for strategies and solutions on their own, and to learn to evaluate their own results. Though the teacher needs to be very much present, the students' main focus needs to be on their own thinking processes.

Problem solving also requires a shift in students' attitudes. In order to become successful problem solvers, it is useful for students to develop the following characteristics: interest in finding solutions to problems, confidence to try various strategies, willingness to risk being wrong at times, ability to accept frustrations that come from not knowing, willingness to persevere when solutions are not immediate, understanding of the difference between not knowing the answer and not having found it yet. This is not a casual list of qualities. Teachers need to model these attitudes in order to help develop them in their students. To this end, students must feel that their teacher values problem solving as an important activity. It is not enough for a teacher to provide for problem solving in the classroom. Teachers need to present themselves as problem solvers, as active learners who are seekers, willing to plunge into new situations, not always knowing the answer or what the outcome will be.